

TABLE 1
SUMMARY OF DATA QUALITY OBJECTIVES (DQO) PROCESS - GROUNDWATER INVESTIGATION
SOUTH DAYTON DUMP AND LANDFILL SITE
MORaine, OHIO

Investigation Phase: DQO Step		Investigation Phase: DQO Step		General OU1 Groundwater Investigation	Phase 1A Geoprobe Investigation Source or Data Gap Area Site Investigations	Phase 1B Installation of Permanent Wells Source or Data Gap Area Site Investigations	Phase 2A Vertical Aquifer Samples Downgradient GW Contaminant Investigation
1	State the Problem	1	State the Problem				
	i) Problem description:		i) Problem description:	Insufficient information exists to develop remedial alternatives for the groundwater contamination beneath the Site. Information regarding the potential for contaminated groundwater to migrate off-Site is required in order to develop a remedy decision.	Groundwater samples from a number of on-Site wells and Vertical Aquifer Sampling (VAS) locations contain contaminants at concentrations greater than MCL RSLs. The nature and extent of potential areas of on-Site groundwater contamination have not been fully delineated. Further investigation and sampling is required to delineate the vertical and lateral extent of contamination in areas of concern, and identify the direction of contaminant migration. The following are OU1 shallow on-Site groundwater areas of concern, or data gaps (discussed in further detail in draft OU1 RI/FS): - VAS-9 (cs-1,2-DCE, TCE, VC) - VAS-9 (TCE, possibly related to VAS-9 source) / TT-9 - VAS-15 (TCE, related to VAS-9 source) - VAS-04/MW-219 (LNAPL) - MW-210 (TCE) - TT-21 / MW-229 (VOCs and TCLP lead (TCE) - TT-22 / GP18-09 (VOCs in soil and soil gas, TCLP lead / methane) - TT-23 / GP20-09 (TCE and lead / chlorinated solvents)	If groundwater samples from Phase 1A are greater than Action Levels, permanent monitoring wells will be installed at select locations in order to monitor groundwater contamination. Permanent monitoring well installations can occur at any point in the phased process, and will not be limited in schedule to the end of Phase 1A.	Groundwater samples from a number of on- and off-Site wells contain contaminants at concentrations greater than MCL RSLs. Insufficient data exist to determine whether or not groundwater migrating off-Site in shallow or deep groundwater contains contaminants at concentrations greater than Action Levels. A secondary question concerns whether some of the groundwater contamination results from off-Site or upgradient sources, which may need to taken into consideration when evaluating and designing remedial options. Further sampling is required to delineate the vertical extent of known areas of groundwater contamination and areas identified during Phase 1. Further sampling may be required to delineate the lateral extent of contamination and identify sources of contamination. Vertical Aquifer Sampling (VAS) is required, following the Phase 1 GW investigations to determine the intervals of greatest contaminant concentrations and to vertically delineate any contaminant plumes. A minimum of two rounds of VAS investigation may be required.
					Soil contamination and geophysical anomalies at several locations have not been completely investigated to date and present data gaps. Other data gap areas to be further investigated during Phase 1 GW Investigation, using test pit or test trench techniques or soil boreholes, include: - TP-3 (16 ft bgs) chlorobenzene soil concentration - Geophysical Anomalies in the areas of TT-21, TT-23, TP-3, VAS-9, and two anomalies along 1951 Dryden Road, Parcel 5171 - Large Pond and landfill entrance #3, where drums were reportedly dumped		
	ii) Planning team		ii) Planning team	See note at bottom			
	iii) Conceptual model		iii) Conceptual model	See attached figure and -Shallow groundwater has been demonstrated to typically flow west/southwest across the Site and/or radially (in the northern part of the	< Same as for Phase 1 (see left) >		
	iv) General intended use for data		iv) General intended use for data	To assist in the development of remedial alternatives for groundwater contamination originating from the Site that is or has the potential to migrate off Site and, to further investigate the groundwater contamination identified to date.	The data from initial screening level investigations will be used to guide subsequent investigations (i.e. determine location of permanent monitoring wells). The data will be compared against health-based risk values and applicable USEPA MCL RSL criteria.	The data will be compared against health-based risk values and applicable USEPA MCL RSL criteria. The data collected from permanent groundwater monitoring wells will ultimately be used in the Baseline Risk Assessment for OU1, and to scope the OU2 RI.	The data from initial screening level investigations will be used to guide subsequent investigations (i.e., determine location of permanent monitoring wells). The data will be compared against health-based risk values and applicable USEPA MCL RSL criteria.
	v) Resources, constraints, deadlines		Resources: Information of off-Site groundwater migration is constrained by access agreements to off-Site land parcels. Constraints: Existing wells will be utilized to the degree possible in determining the spatial extent of contaminated groundwater. Deadlines: All areas of groundwater contamination or having the potential to result in groundwater contamination may not have been identified and the size of the landfill and potential presence of more widespread, low level concentrations of contaminants may render such				

TABLE 1

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SOUTH DAYTON DUMP AND LANDFILL SITE
MORaine, OHIO

iii) Basis of Action Level	iii) Basis of Action Level	See specific details at right for each Phase of the investigation.	Action Levels as previously agreed with USEPA are: 1) USEPA MCL RSL criteria 2) Excess Lifetime Cancer Risk (ELCR) >10 ⁻⁶ 3) Hazard Index (HI) > 1 (noncarcinogens) Respondents will evaluate the analytical results against MCLs where available. Where MCLs are not available, ELCR and HI values will be compared to the individual contaminant concentrations for screening purposes.	Action Levels as previously agreed with USEPA are: 1) USEPA MCL RSL criteria 2) ELCR >10 ⁻⁶ 3) HI > 1 (noncarcinogens) 4) Cumulative risk/hazards Respondents will evaluate the analytical results against MCLs where available. Where MCLs are not available, ELCR and HI values will be compared to the individual contaminant concentrations for screening purposes. For risk assessment purposes, cumulative risk levels for all contaminants will be determined.	Action Levels as previously agreed with USEPA are: 1) USEPA MCL RSL criteria 2) ELCR >10 ⁻⁶ 3) HI > 1 (noncarcinogens) 4) On-Site concentration > upgradient off-Site concentration Respondents will evaluate the analytical results against MCLs where available. Where MCLs are not available, ELCR and HI values will be compared to the individual contaminant concentrations for screening purposes.
iv) Appropriate sampling & analysis methods	Method iv) Appropriate sampling & analysis methods	Method iv) Appropriate sampling & analysis methods	Sampling Plan (CRA, January 2011), the Final Groundwater Investigation Letter Work Plan (CRA, May 7, 2008), and in accordance with the Quality Assurance Project Plan (CRA, September 2008).		

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SOUTH DAYTON DUMP AND LANDFILL SITE
MORaine, OHIO

4 <u>Define the Boundaries of the Study</u> <u>Define the Boundaries of the Study:</u>					
i) Target population, sample units	i) Target population, sample units	See specific details at right for each Phase of the investigation.	Target population is contaminants in the Upper Aquifer Zone groundwater at locations agreed upon with USEPA. Sampling units are groundwater samples collected at individual temporary wells.	Target population is all the areas of highest contaminant concentrations in the Upper Aquifer Zone as determined in Phase 1A at permanent monitoring well locations. Sampling units are individual groundwater samples.	The target population of the VAS investigation is groundwater in the Upper and Lower Aquifer Zones beneath and downgradient of Site-related contamination, in particular the horizontal layer(s) with highest contaminant concentrations. Sampling units of the VAS investigation are single vertical aquifer samples at various intervals in each borehole.
ii) Specify spatial boundaries	ii) Specify spatial boundaries	See specific details at right for each Phase of the investigation.	The spatial boundaries for the study area include the Upper Aquifer Zone groundwater in the OU1 shallow on-Site groundwater areas of concern or data gap areas, previously outlined in DQO Step 1i.	The spatial boundaries are on-Site areas identified in the previous Phase 1A investigation to be areas of potential contamination due to Site-related plumes.	The spatial boundaries are Site areas of groundwater contamination identified based on the Phase 1 investigation. VAS spatial boundaries are defined by the (i) top of water-bearing zone to (ii) 200 feet below ground surface (ft bgs) under the Site and may include on-Site and off-Site locations.
iii) Specify temporal boundaries	iii) Specify temporal boundaries	See specific details at right for each Phase of the investigation.	The temporal boundaries are based on the project schedule. Each Geoprobe temporary monitoring well installation is a single time point event, which will not be repeated.	Permanent monitoring wells can be installed at any time based on the results of the Phase 1A investigation. Two sampling events will be carried out at newly installed monitoring wells, during periods of high (i.e. February - April) or low (i.e., June - September) groundwater elevations. Seasonal groundwater flow fluctuations will be evaluated based on historic Site data, and will be demonstrated by the completion of a Site-wide groundwater elevation monitoring round completed prior to each sampling event.	Temporal boundaries for this investigation element will be identified during scoping of Phase 2 work. VAS investigations will be single time point events, which will not be repeated.
iv) Identify any other practical constraints	iv) Identify any other practical constraints	See specific details at right for each Phase of the investigation.	Site boundaries enclosed by fenceline may limit the proximity of boreholes and temporary monitoring wells to the Site boundaries.	The need to obtain access agreements from off-Site property owners, and the presence of buildings and structures may limit the ability to install monitoring wells.	The need to obtain access agreements from off-Site property owners and the presence of off-Site buildings and structures may limit the ability to advance VAS boreholes off-Site in order to confirm any suspected off-Site groundwater contaminant migration.
v.a) Scale of inference for decision making	v.a) Scale of inference for decision making	See specific details at right for each Phase of the investigation.	Comparisons to action levels and/or upgradient conditions will be carried out on an individual-location basis.		
v.b) Scale of estimates	v.b) Scale of estimates		N/A	N/A	N/A

5 <u>Develop the Analytic Approach:</u> <u>Develop the Analytic Approach:</u>					
i.a) Specify Action Level	i.a) Specify Action Level	See specific details at right for each Phase of the investigation.	1) USEPA MCL RSL criteria 2) Cancer risk > 10 ⁻⁶ to 10 ⁻⁴ 3) Hazard Index > 1 (noncarcinogens)	1) USEPA MCL RSL criteria 2) Cancer risk > 10 ⁻⁶ to 10 ⁻⁴ 3) Hazard Index > 1 (noncarcinogens)	1) USEPA MCL RSL criteria 2) Cancer risk > 10 ⁻⁶ to 10 ⁻⁴ 3) Hazard Index > 1 (noncarcinogens) 4) On-Site concentration > upgradient off-Site concentration
i.b) Specify estimator	i.b) Specify estimator		N/A	N/A	N/A
ii.a) Specify population parameter of interest and theoretical decision rule	ii.a) Specify population parameter of interest and theoretical decision rule	See specific details at right for each Phase of the investigation.	Maximum value (for protection of any point within aquifer)	Maximum value (for protection of any point within aquifer)	Maximum value (for protection of any point within aquifer), or maximum on-Site vs. upgradient
ii.b) Specify estimation procedure	ii.b) Specify estimation procedure		N/A	N/A	N/A

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SOUTH DAYTON DUMP AND LANDFILL SITE
MORaine, OHIO

6 Specify Performance or Acceptance Criteria: <div><div>i.a) Set baseline (null) and alternative hypotheses</div><div>i.a) Set baseline (null) and alternative hypotheses</div><div>See specific details at right for each Phase of the investigation.</div><div>Baseline H₀: groundwater sample concentrations are less than Action Levels Alternative H₁: groundwater sample concentrations are greater than Action Levels</div><div>Baseline H₀: groundwater sample concentrations are less than Action Levels or are consistent with upgradient conditions (i.e., source is upgradient, either on or off-Site) Alternative H₁: groundwater sample concentrations are greater than Action Levels or upgradient conditions (i.e., contamination is Site-related) Should an exceedance of Action Levels occur in one, but not both sampling events, or if results should increase from one event to the next, further assessment will be required. Further assessment will include, as appropriate, the use of historical data, consideration of the level of the groundwater table, groundwater flow direction, and/or proximity to a known or suspected source area. The further assessment may lead to recommendations for further monitoring or remediation.</div><div>Baseline H₀: groundwater sample concentrations are less than Action Levels or are consistent with upgradient conditions (i.e., source is upgradient, either on or off-Site) Alternative H₁: groundwater sample concentrations are greater than Action Levels or upgradient conditions (i.e., contamination is Site-related)</div></div>						
i.b) Specify how uncertainty accounted for in estimate	i.b) Specify how uncertainty accounted for in estimate	N/A	N/A	N/A	N/A	N/A
ii.a) Determine impact of decision errors (false positives/negatives)	ii.a) Determine impact of decision errors (false positives/negatives)	See specific details at right for each Phase of the investigation.	N/A - since comparing to maximum value, no statistical test is employed	1) For comparisons to Action Levels, N/A, since comparing to maximum value, no statistical test is employed. 2) For comparisons to upgradient conditions, if a false positive (Type I) error occurs, an on-Site source is inferred, which will result in unneeded additional investigation; if a false negative (Type II) error occurs, an incorrect determination that the location is not a source area will be made.	1) For comparisons to Action Levels, N/A, since comparing to maximum value, no statistical test is employed. 2) For comparisons to upgradient conditions, if a false positive (Type I) error occurs, an on-Site source is inferred, which will result in unneeded additional investigation; if a false negative (Type II) error occurs, an incorrect determination that the location is not a source area will be made.	
ii.b) Specify confidence level for estimate	ii.b) Specify confidence level for estimate	N/A	N/A	N/A	N/A	
iii) Specify "gray region" for test	iii) Specify "gray region" for test	See specific details at right for each Phase of the investigation.	N/A - since comparing to maximum value, no statistical test is employed	1) For comparisons to Action Levels, N/A, since comparing to maximum value and no statistical test is employed. 2) For comparisons to upgradient conditions, the gray region will be set equal to a difference in means (on-Site and upgradient) of one standard deviation of the upgradient data.	1) For comparisons to Action Levels, N/A, since comparing to maximum value and no statistical test is employed. 2) For comparisons to upgradient conditions, the gray region will be set equal to a difference in means (on-Site and upgradient) of one standard deviation of the upgradient data.	
iv.a) Set tolerable limits on decision errors	iv.a) Set tolerable limits on decision errors	See specific details at right for each Phase of the investigation.	N/A - since comparing to maximum value, no statistical test is employed	1) For comparisons to Action Levels, N/A 2) For comparisons to upgradient conditions: RCRA regulations specify a false rejection decision error limit of 0.05 (5%). Following RCRA guidance, the false acceptance (Type II) error limit will be set at 0.10 (10%) on an individual-well basis. (These tolerable limits will be reviewed for viability after obtaining Phase 1 data.)	1) For comparisons to Action Levels, N/A 2) For comparisons to upgradient conditions: RCRA regulations specify a false rejection decision error limit of 0.05 (5%). Following RCRA guidance, the false acceptance (Type II) error limit will be set at 0.10 (10%) on an individual-well basis. (These tolerable limits will be reviewed for viability after obtaining Phase 1 data.)	
iv.b) Specify performance or acceptance criteria	iv.b) Specify performance or acceptance criteria	N/A	N/A	N/A	N/A	

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MORaine, OHIO

7 Develop the Plan for Obtaining DataDevelop the Plan for Obtaining Data:						
i) Select sampling design	See table ii) Select sampling design	Phase of the investigation.	Geoprobe boreholes will be advanced at locations agreed-upon between USEPA and Respondents. Following completion of the investigation, the Respondents will recommend additional temporary boreholes, permanent monitoring wells, or remedial activities in order to further define or mitigate unacceptable risks posed by contaminants in shallow groundwater in areas of concern. Proposed Geoprobe borehole locations will be based on historical and physical knowledge of the underlying Site condition, and will include areas previously identified as potential source areas or data gaps. The locations will be selected to provide information regarding the lateral distribution of contaminants at areas of concern.	Monitoring wells will be installed at select on-Site locations identified in Phase 1A as areas of potentially unacceptable risks or areas of significantly elevated contaminant concentrations. Respondents will discuss the initial Phase 1A data with USEPA to determine the next steps and suitable locations of permanent monitoring wells. Two sampling event will be carried out at newly installed monitoring wells. Parameters included in the second round of analyses may be decreased depending on the results of the first round.	Detailed selection of a sampling design would be completed in a Phase 2A investigation work plan. VAS locations for the Phase 2A investigation will be based on historical and physical knowledge of the underlying Site condition, as well as the results of the Phase 1 groundwater investigation. The locations will be selected to provide information regarding the vertical distribution of contaminants at key source areas (either presently known or identified based on Phase 1 groundwater investigation results, and to assess the potential for off-Site migration at downgradient Site boundaries.	
ii) Specify/evaluate key assumptions supporting the design	ii) Specify/evaluate key assumptions supporting the design	See specific details at right for each Phase of the investigation.	The basis of comparison for the selected Action Levels (MCL RSLs, target risk or hazard index) is using individual groundwater samples, which therefore do not require statistical assumptions for testing.	The basis of comparison for the selected Action Levels (MCL RSLs, target risk or hazard index) is using individual groundwater samples, which therefore do not require statistical assumptions for testing. Statistical hypothesis tests comparing on-Site vs. upgradient means require normally distributed distributions with equal variances for parametric tests. If this assumption is not met, non-parametric tests of medians are available.	The basis of comparison for the selected Action Levels (MCL RSLs, target risk or hazard index) will use individual groundwater samples, which therefore do not require statistical assumptions for testing. The selection of individual VAS boreholes assumes prior knowledge of potential groundwater flow directions in the aquifers underlying the Site. Statistical hypothesis tests comparing on-Site vs. upgradient means require normally distributed distributions with equal variances for parametric tests. If this assumption is not met, non-parametric tests of medians are available.	

Notes:

Notes:

- (1) If investigating a "decision problem", follow the steps in the decision problem table. If investigating an "estimation problem", follow the steps in the estimation problem table. If investigating an "estimation problem", follow the steps in the estimation problem table.
- (2) USEPA Guidance establishes an area of concern (AOC) as a potential impact area. VOC emissions tend to be insignificant at lateral distances of approximately 100 ft transgradient to groundwater flow from a source. (ITRC, January 2007, Vapor Intrusion Pathway. USEPA, 2002, OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils.)
- Item not applicable for the type of problem (decision vs. estimation) investigated.

The planning team includes: Steve O'Leary (CRA Project Director), Adam Loney (CRA project manager), Wesley Dyck (CRA statistics expert), April Gowing, Steve Harris, Vincent Nero and Dan Smith (CRA risk assessment experts), Paul Wiseman and Rawa Fleisher (CRA chemists/quality assurance staff), Valerie Chan (CRA project engineer), Alan Deal (CRA project hydrogeologist), Leslie Patterson (USEPA Regional Project Manager), Laura Marshall (Ohio EPA representative), and property owner stakeholders.

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Investigation Phase:		Phase 2B
Investigation Item:		Installation of Permanent Wells
DQO Step		Downgradient GW Contaminant Investigation
1	State the Problem	
i) Problem description:		If groundwater samples from Phase 2A are greater than Action Levels, permanent monitoring wells will be installed at select locations at the intervals of greatest contamination in order to monitor groundwater contamination. Permanent monitoring well installations can occur at any point in the phased process, and will not be limited in schedule to the end of Phase 2A.
ii) Planning team		
iii) Conceptual model		
iv) General intended use for data		The data will be compared against health-based risk values and applicable USEPA MCL RSL criteria. The data collected from permanent groundwater monitoring wells will ultimately be used in the Baseline Risk Assessment for OU1, and potentially OU2.
v) Resources, constraints, deadlines		
ification difficult or infeasible		

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MORaine, OHIO

2	<u>Goals of the Study:</u>	
	I) Primary study question	<div>What are the groundwater contaminant concentrations at newly installed permanent monitoring wells with screened intervals set based on the results of previous phased investigations?</div> <div>If maximum concentrations within the permanent monitoring well are less than Action Levels, installing groundwater in the vicinity of the monitoring well is not contaminated, only future monitoring will be completed (if required).</div> <div>If maximum concentrations at the Site boundaries are less than those found in upgradient background/off-Site wells within the same aquifer zone and a Site-related source is not identified, no further monitoring is planned.</div> <div>If groundwater monitoring well sample result concentrations are greater than background concentrations, and greater than Action Levels, further evaluation and/or control measures may be warranted.</div>
	III) Type of problem (decision or estimation)?	Decision (Action Level)
	iv.a) Decision statement	Determine whether any contaminant concentrations are greater than Action Levels in permanent monitoring wells.
	iv.b) Estimation statement & assumptions	N/A
3	<u>Identify Information Inputs:</u>	
	i) Information types needed	<div>This would be a new data collection effort, with installation of permanent monitoring wells, and collection of groundwater samples from the permanent monitoring wells. Groundwater samples will be analyzed for TCL VOCs, SVOCs, PCBs, pesticides, and herbicides and TAIL metals. Parameters of concern would be determined based on the outcome of Phase 1A, 1B, and 2A, and using historical data.---</div> <div>---</div>
ii) Information sources		

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SOUTH DAYTON DUMP AND LANDFILL SITE
MORaine, OHIO

iii) Basis of Action Level	Action Levels as previously-agreed with USEPA are: 1) USEPA MCL, RSL, criteria 2) ELCR >10 ⁻⁶ 3) HI > 1 (noncarcinogens) 4) On-Site concentration > upgradient off-Site concentration Respondents will evaluate the analytical results against MCLs where available. Where MCLs are not available, ELCR and HI values will be compared to the individual contaminant concentrations for screening purposes. For risk assessment purposes, cumulative risk levels for all contaminants will be determined.	
iv) Appropriate sampling & analysis methods		

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SOUTH DAYTON DUMP AND LANDFILL SITE
MORaine, OHIO

4

Define the Boundaries of the Study:

i) Target population, sample units	Target population is all the areas of highest contaminant concentrations in the Upper and Lower Aquifer Zones as determined in Phase 1A, 1B, and 2A at permanent monitoring well locations. Sampling units are individual groundwater samples.
ii) Specify spatial boundaries	The spatial boundaries are on-Site and off-Site areas of groundwater contamination identified in previous Phase 1A, 1B, and 2A investigations as areas of potential contamination due to Site-related plumes.
iii) Specify temporal boundaries	Permanent monitoring wells can be installed at any time based on the results of the Phases 1A, 1B, and 2A investigation. Two sampling events will be carried out at newly installed monitoring wells, during periods of high (i.e. February - April) or low (i.e., June - September) groundwater elevations. Seasonal groundwater flow fluctuations will be evaluated based on historic Site data, and will be demonstrated by the completion of a Site-wide groundwater elevation monitoring round completed prior to each sampling event. Additional synoptic groundwater elevation monitoring rounds may be recommended based on the data obtained during Phase 2B.
iv) Identify any other practical constraints	The need to obtain access agreements from off-Site property owners, and the presence of buildings and structures may limit the ability to install monitoring wells.
v.a) Scale of inference for decision making	
v.b) Scale of estimates	N/A

5

Develop the Analytic Approach:

i.a) Specify Action Level	1) USEPA MCL RSL criteria 2) Cancer risk > 10 ⁻⁶ to 10 ⁻⁴ 3) Hazard Index > 1 (noncarcinogens) 4) On-Site concentration > upgradient off-Site concentration
i.b) Specify estimator	N/A
ii.a) Specify population parameter of interest and theoretical decision rule	Maximum value (for protection of any point within aquifer), or maximum on-Site vs. upgradient
ii.b) Specify estimation procedure	N/A

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SOUTH DAYTON DUMP AND LANDFILL SITE
MORaine, OHIO

6 <u>Specify Performance or Acceptance Criteria:</u>	
i.a) Set baseline (null) and alternative hypotheses	<p>Baseline H₀: groundwater sample concentrations are less than Action Levels or are consistent with upgradient conditions (i.e., source is upgradient, either on or off-Site)</p> <p>Alternative H₁: groundwater sample concentrations are greater than Action Levels or upgradient conditions (i.e., contamination is Site-related).</p> <p>Should an exceedance of Action Levels occur in one, but not both sampling events, or if results should increase from one event to the next, further assessment will be required. Further assessment will include, as appropriate, the use of historical data, consideration of the level of the groundwater table, groundwater flow direction, and/or proximity to a known or suspected source area. The further assessment may lead to recommendations for further monitoring or remediation.</p>
i.b) Specify how uncertainty accounted for in estimate	N/A
ii.a) Determine impact of decision errors (false positives/negatives)	<p>1) For comparisons to Action Levels, N/A, since comparing to maximum value, no statistical test is employed.</p> <p>2) For comparisons to upgradient conditions, if a false positive (Type I) error occurs, an on-Site source is inferred, which will result in un-needed additional investigation; if a false negative (Type II) error occurs, an incorrect determination that the location is not a source area will be made.</p>
ii.b) Specify confidence level for estimate	N/A
iii) Specify "gray region" for test	<p>1) For comparisons to Action Levels, N/A, since comparing to maximum value and no statistical test is employed.</p> <p>2) For comparisons to upgradient conditions, the gray region will be set equal to a difference in means (on-Site and upgradient) of one standard deviation of the upgradient data.</p>
iv.a) Set tolerable limits on decision errors	<p>1) For comparisons to Action Levels, N/A</p> <p>2) For comparisons to upgradient conditions: RCRA regulations specify a false rejection decision error limit of 0.05 (5%). Following RCRA guidance, the false acceptance (Type II) error limit will be set at 0.10 (10%) on an individual-well basis. (These tolerable limits will be reviewed for viability after obtaining Phase I data.)</p>
iv.b) Specify performance or acceptance criteria	N/A

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SOUTH DAYTON DUMP AND LANDFILL SITE
MORaine, OHIO

7	<u>Develop the Plan for Obtaining Data:</u>	<p>Monitoring wells will be installed at locations identified in Phases 1A, 1B, and 2A as areas of potentially unacceptable risks or areas of significantly elevated contaminant concentrations. Respondents will discuss the initial Phase 2A data, and all previous data with USEPA to determine the next steps and suitable locations of permanent monitoring wells.</p> <p>Two sampling events will be carried out at newly installed monitoring wells. Parameters included in the second round of analysis may be decreased depending on the results of the first round.</p> <p>A stratified-random design would be used to ensure that a suitable network of on-Site and upgradient monitoring wells is established to determine potential on-Site source areas. This design would include a more-intense well network (i.e., smaller strata) near known on-Site activities, and larger strata in other areas. A sufficient number of upgradient monitoring locations (3 to 4) would be employed to represent spatial variability in groundwater flowing towards the Site.</p>
	ii) Specify/evaluate key assumptions supporting the design	<p>The basis of comparison for the selected Action Levels (MCL RSLs, target risk or hazard index) is using individual groundwater samples, which therefore do not require statistical assumptions for testing.</p> <p>Statistical hypothesis tests comparing on-Site vs. upgradient means require normally distributed distributions with equal variances for parametric tests. If this assumption is not met, non-parametric tests of medians are available.</p>

Notes:

(*) If investigating a "decision problem", follow items ending in "a" in subsequent DQO steps (e.g., "i.a" or "iii.a").

If investigating an "estimation problem", follow "b" items.

January 2007, Vapor Intrusion Pathway. USEPA, 2002, OSWER Draft. USEPA Guidance establishes an area within 100 ft vertically or laterally from a volatile concentration of regulatory concern as a potential impact area. VOC emissions tend to be insignificant at lateral distances of approximately 100 ft transgradient to groundwater flow from a source. (ITRC, January 2007, Vapor Intrusion Pathway. Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils.)

- Item not applicable for the type of problem (decision vs. estimation) investigated.

staff, Valerie Chan (CRA project engineer), Alan Deal (CRA project hydrogeologist), Leslie Patterson (USEPA Regional Project Manager), Laura Marshall (Ohio EPA representative), and property owner stakeholders.